SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT

FINAL DRAFT STAFF REPORT

Rule 4313 (Lime Kilns)

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February 10, 2003

I. REASONS FOR RULE DEVELOPMENT AND IMPLEMENTATION

Sections 182(b)(2) and 182(f) of the Clean Air Act require ozone nonattainment areas to implement Reasonably Available Control Technology (RACT) for sources that are subject to Control Technology Guideline (CTG) documents issued by the United States Environmental Protection Agency (EPA), and for "major sources" of Volatile Organic Compounds (VOCs) and Oxides of Nitrogen (NOx). In serious ozone nonattainment areas, stationary source facilities that emit at least 50 tons of NOx or VOC per year are considered "major sources." For severe areas, the Clean Air Act expands the definition of "major source" to stationary sources that emit at least 25 tons per year of VOC or NOx. While the San Joaquin Valley Unified Air Pollution Control District (District) has already adopted appropriate RACT provisions for CTG categories, the reclassification of the San Joaquin Valley to severe nonattainment requires the District to implement RACT for the newly defined major sources. In their October 2001 notice to reclassify of the San Joaquin Valley, EPA set May 31, 2002 as the deadline for submittal of the RACT rules. Failure to submit the necessary RACT rules by that date would start a sanction clock. Additionally, EPA strongly encouraged the District to fully implement the RACT rules by June 2003.

Purpose and Stringency of RACT

As District staff understands the Clean Air Act, RACT is not intended as the primary attainment strategy for ozone nonattainment areas. Section 172 of the Act indicates that states' ozone attainment plans must contain Reasonably Available Control Measures (RACM) that will achieve the emissions reductions necessary for the area to attain the ozone standard. RACT requirements on the other hand, are included in the Clean Air Act to assure that significant source categories at major sources are controlled to a "reasonable" extent, but not to Best Available Control Technology (BACT) or Lowest Achievable Emission Rate (LAER) levels expected of new sources. Because of the need for ozone precursor emission reductions in the Valley, District staff believes that the District's RACT rules should not be less stringent than prohibitory rules already in place.

New RACT requirements are not expected to yield regionally significant emission reductions, but will assure that significant emission sources at major sources are reasonably controlled.

Applicability of RACM and All Feasible Control Measures

In moving forward to implement RACT requirements District staff sought to identify source categories that emit more than 25 tons of NOx or VOC per year valley wide and which contribute to emissions at major sources. An extensive review of District emission inventory and permit files revealed that a vast majority of source categories meeting these criteria are currently controlled by District prohibitory rules, and only seven source categories meeting the criteria are not controlled by source-specific prohibitory rules. Of the seven categories, three (glycol dehydration operation, fiberglass curing, ovens, and nitric acid plants) are currently subject to federal emission standards, which District staff believes that further RACT development is not necessary. RACT Rule 4692 (Commercial Charbroiling), Rule 4693 (Bakery Ovens) Rule 4610 (Glass Coating Operations) have already been adopted by the District Governing Board. The only remaining RACT rule that needs to be completed in order to comply with the federal Clean Air Act is Rule 4313 (Lime Kilns).

Also, because of the severe nonattainment reclassification, the District is required by Section 172 of the Federal Clean Air Act Amendments of 1990 to implement RACM as expeditiously as practical in order to attain the National Ambient Air Quality Standards (NAAQS) by reducing ozone-forming emissions of VOC and NOx. The EPA describes RACM as control measures determined to be reasonable after considering their energy and environmental impacts, and their annualized capital and operations costs. In addition to implementing RACM, the California Clean Air Act requires nonattainment areas to adopt all feasible control measures for stationary sources of air pollution. The California Air Resources Board (ARB) interprets “every feasible control measures to mean that, at a minimum, a district considers regulations that have been successfully implemented elsewhere. They should also consider going beyond what has already been accomplished by evaluation of new technologies and innovative approaches that may offer potential emissions reductions. Further, districts should consider not only technological factors, but also social, environmental, economic (e.g., cost effectiveness), and energy factors which prevail in the district, along with the resources realistically available to the district to adopt, implement, and enforce the measures.”

District staff believe the adoption of Rule 4313 will satisfy the RACT and RACM requirements of the Clean Air Act. The estimated potential emission reduction is about 19 tons/yr of NOx as shown in Section IV of the staff report.

II. RULE DEVELOPMENT PROCESS

District staff conducted workshops for draft Rule 4313 in February and March 2002. A public hearing to consider adoption of Rule 4313 by the District Governing Board was

scheduled for May 16, 2002. The public hearing was postponed in order to evaluate stakeholder's comments and concerns that District staff received during the commenting period. District staff conducted a second round of public workshops on October 17, 2002 and January 21, 2003. The District solicited comments from the public, affected sources, EPA, and ARB on the revised draft Rule 4313. A summary of significant comments and responses can be found in Appendix A. Comments received during the workshops were used to refine the draft rule as appropriate. The adoption of proposed Rule 4313 by the District Governing Board is scheduled for March 20, 2003.

III. BACKGROUND and TECHNOLOGY

Lime and its by-products are used by many different industries for various purposes. In the metallurgical industry, lime serves various purposes such as aiding in the purification of steel, and creating a furnace slag. In aluminum extraction, lime is used to free caustic soda from sodium carbonate to allow the caustic to further react. In gold extraction, lime is used to maintain alkaline conditions during treatment by cyanide. In the extraction of other metals, lime is used to adjust the pH of the suspensions of ore in water to aid in the flotation process.

In the sugar industry, lime is used to reduce the acidity of the sugar juice after the sugar cane or beet has been crushed and the sugar washed out. This juice contains mud and other impurities and the lime is used to react with these impurities causing them to settle out of the juice and help them coagulate the mud. The solids are settled out of the juice, filtered leaving sugar juice, which undergoes further processing.

Lime is also used in other various industries. Potable water treatment plants add lime to stabilize the water and improve the retention of chlorine. The building industry uses lime as the basis of whitewash. It is also used to improve the workability and water tightness of cement mortars and is sometimes used as a plaster or white set. Lime can also act as a road stabilization binder in the presence of clay. As an alkali, lime neutralizes acidic conditions in soils due to water run-off from coalmines and in coalmine process water.

General Process and Equipment Description

Lime is created through a process called calcination where limestone ($CaCO_3$) is heated to temperatures above 900^o Celsius, to drive off carbon dioxide. The resulting product is calcium oxide, or lime. Lime kilns are often used as the heat source and it is not unusual for these kilns to reach temperatures above 1500^o Celsius.

Lime kilns come in various shapes and sizes. The prevalent type of kiln is the rotary kiln, accounting for about 90% of all lime production in the United States. This kiln is a long, cylindrical, slightly inclined, refractory-lined furnace, through which the limestone and hot combustion gases pass counter currently. Coal, oil, and natural gas may all be fired in rotary kilns. Product coolers and kiln feed preheaters of various types are commonly used to recover heat from the hot lime product and hot exhaust gases, respectively.

The next most common type of kiln in the United States is the vertical, or shaft, kiln. This can be described as an upright heavy steel cylinder lined with refractory material. The limestone is charged at the top and is calcined as it descends slowly to discharge at the bottom of the kiln. The primary advantage of vertical kilns over rotary kilns is higher average fuel efficiency and the disadvantages of vertical kilns are their relatively low production rates and the fact that coal cannot be used without degrading the quality of the lime produced.

Other, much less common, kiln types include rotary hearth and fluidized bed kilns. Both kiln types can achieve high production rates, but neither can operate with coal. The "calcimatic" kiln, or rotary hearth kiln, is a circular kiln with a slowly revolving doughnut-shaped hearth. In fluidized bed kilns, finely divided limestone is brought into contact with hot combustion air in a turbulent zone, usually above a perforated grate. Because of the amount of lime particle carryover into the exhaust gases, dust collection equipment must be installed on fluidized bed kilns to prevent the buildup of particles and to keep the process flowing smoothly.

Lime kilns emit several different kinds of pollutants. For the purpose of this staff report, control of NOx emissions will be discussed. Most of the controls listed in this staff report for lime kilns are used on cement kilns. Lime production differs from cement production in that only one raw material is fed to the kiln, along with a heat source. Several control techniques have been demonstrated to reduce NOx emissions from kilns. These controls are:

Fuel Substitution: Fuel substitution consists of burning lower nitrogen fuels. Fuel alteration includes burning emulsified heavy oil and water mixtures.

Combustion Controls: Combustion controls reduce NOx by suppressing NOx formation during the combustion process, and include: low excess air, burners out of service, biased burning firing, flue gas recirculation, overfire air, and low NOx burners.

Mid-kiln firing: Mid-kiln firing is a secondary firing in kiln systems by injecting solid fuel at an intermediate point in the kiln system using a specially designed fuel injection mechanism. Mid-kiln firing reduces NOx emissions by burning part of the fuel at a lower temperature and reducing conditions at the fuel injection point that may destroy some of the NOx formed upstream in the kiln burning zone.

Advanced Mineral Calciner (AMC): In the AMC, the spent mud is reconstituted into pellets, which are then dried prior to calcining in a bed. The regenerated lime pellets are removed from the bed by vibrating hoppers. The AMC system has a much better heat transfer between the gas and the pellets than does a rotary kiln because the reactor (porous bed) is filled with solids, thus reducing system size. In addition to being smaller than a rotary kiln, the AMC system does not rotate, so it can be heavily insulated to minimize heat loss, thus resulting in high system efficiency. The AMC technology will save an estimated 2.3 million to 7.3 million Btu/ton of lime produced

from the recovery process as compared to the output of the rotary kiln, depending on size. The average NOx emissions of 200 ppm can be reduced to less than 40 ppm.

Control Standards Currently in Place

NOx emissions from lime kilns are, for the most part, unregulated. The Wisconsin Department of Natural Resources does have a rule in their Administrative code applicable to lime kilns. The Wisconsin rule specifies the following emission limits depending on fuel type over a 30-day rolling average basis:

a. 0.10 lbs NOx per million Btu when burning gaseous fuel;
b. 0.12 lbs NOx per million Btu when burning distillate fuel;
c. 0.20 lbs NOx per million Btu when burning residual fuel oil;
d. 0.60 lbs NOx per million Btu when burning solid fuel.

Rule Summary

Comments from EPA and industry were used to refine the January 6, 2003 draft version of Rule 4313. One of the major changes to the previous draft is the removal of the combustion optimization requirement. The affected source had requested the District to consider removing the combustion optimization requirements of the January 6, 2002 draft version of Rule 4313 if the source would comply with the proposed limits sooner than the June 2004 compliance date.

Proposed Rule 4313 adds the following changes:

- Deletion of definition for combustion optimization.
- Change definition of lime kiln
- Deletion of combustion optimization requirement.
- Change averaging period to be similar to Boiler and Internal Combustion Engine Rules.
- Removal of “at a major NOx source” from applicability.
- Removal of “Major NOx Source” from definitions Section 3.0.
- Move the compliance date up to September 2003.

IV. COST EFFECTIVENESS

Pursuant to state law, the District is required to analyze the cost effectiveness of new rules that implement Best Available Retrofit Control Technology (BARCT). For the purpose of this rule, the RACM requirements are considered as BARCT standards. The RACT requirements are not subject to the cost effectiveness analysis mandate.
In order to calculate the cost effectiveness of the rule, it is necessary to determine the emission reduction achievable by the proposed NOx limits. The reduction, as shown in Table-1, is based on the current permitted limit in comparison with the proposed NOx limit. The District believes that the affected source may already be in compliance with the proposed limits. Costs relating to a portable NOx analyzer were submitted to the District.

The estimated NOx reduction is about 19 ton/yr as shown in Table-1. The cost effectiveness is estimated at $423 as shown in Table-2.

TABLE-1 Emission Reduction

	NOx Permit Limit	Rule 4313 Limit	Reduction
lb/MMBtu	0.367	0.20	
fuel gallons	1,570,000		
MMBtu/gal	0.145		
MMBtu/yr	227650		
lb/yr	83548	45530	38018
t/yr	41.77	22.77	19.01
weeks/yr	29		
days/yr	203		
ton/day	0.21		0.09
lb/day	412		187

The following table contains costs, provided by industry, to comply with emission monitoring requirements listed in Section 4.6 of draft Rule 4313.

TABLE-2 Cost Effectiveness

Capital Cost	$	6,500	
Annualized Capital Cost	$	1,040	
Annual O&M Cost	$	7,000	
Total Annualized Cost	$	8,040	
Approx. NOx Reduction:		19.01 ton/yr	
Cost Effectiveness	= Total Annualized Cost / Annual NOx Reduction		
Cost Effectiveness	$	423	/ton reduced

V. SOCIOECONOMIC ANALYSIS

Additionally, state law requires the District to analyze the socioeconomic impacts of any proposed rule or rule amendment that significantly affects air quality or strengthens an emission limitation. The socioeconomic analysis can be found in Appendix B, and was presented to the public during the final rule workshop on January 21, 2003.

The final socioeconomic report will be presented to the District Governing Board, at a public hearing for adopting the rule, in order to disclose any potential economic impacts.

VI. RULE CONSISTENCY ANALYSIS

Pursuant to California Health & Safety Code Section 40727.2, a rule consistency analysis of the proposed Rule 4313 is as follows: No other District rule regulates this source category, and there is no current or proposed federal regulations or guidance on this source category.

VII. ENVIRONMENTAL IMPACTS

Pursuant to the California Environmental Quality Act (CEQA), staff investigated the possible environmental impacts of the proposed rule. Based on the lack of evidence to the contrary, District staff has concluded Rule 4313 will not have any significant adverse effects on the environment. Staff recommends filing a Notice of Exemption under the provisions of Public Resource Code 15061 (b)(3).

VIII. REFERENCES

AP-42, Chapter 11.17 Lime Manufacturing, February 1998.

Department of Energy, CH10093-345, DE94006946, September 1994;
http://es.epa.gov/program//p2dept/energy/nice3/nice3-8.html
QCL Group of Companies, The Manufacture of Lime, March 1999;
http://www.qcl.com.au/pdf_files/Lime_Manufacture.pdf
Wisconsin Administrative Code, NR 428.04, Register, January 2001, No. 541.

State of California, California Environmental Protection Agency, Air Resources Board, Identification of Performance Standards for Existing Stationary Sources, December 1998.

Wisconsin Department of Natural Resources: Bureau of Air Management
http://www.drn.state.wi.us/org/aw/air/reg/nr400toc.htm

APPENDIX A

SUMMARY OF SIGNIFICANT COMMENTS AND RESPONSES TO
Draft Rule 4313
February 10, 2003

SUMMARY OF SIGNIFICANT COMMENTS
on the
January 21, 2003, DRAFT of RACT Rule:

Rule 4313 (Lime Kilns)

EPA Comments:

1. Comment: We understand that Rule 4313 was modeled after Wisconsin Rule 428.04 and the rules contain the same limits for gaseous, distillate, residual and solid fuel. Since the affected source does not use solid fuel and solid fuel emissions are considerably higher than other fuels, we suggest explicitly prohibiting the use of solid fuel and removing the solid fuel limit from Rule 4313.

Response: The District concurs and the change to Section 4.0 has been made.

2. Comment: As in our previous comments, we recommend revising the units of the limits to pounds of NOx per ton product. The Technical Support Document associated with Wisconsin's rule states that Wisconsin Department of Natural Resources intends to convert their limits accordingly in the next revision of Rule 428.04.

Response: District staff met with the affected source to discuss the technical aspects of the process as it relates to production based limits. At this time no methodology is possible to convert the NOx limit from lb/MMBtu to lb/ton of product. Please refer to the response for comment #1 of the October 2, 2002 draft of Rule 4313.

ARB Comments: None received.

Industry comments

1. Comment: We believe that the rule requirements should only apply to major NOx sources. In the original version of the rule the District limited rule applicability to kilns at major NOx sources. Therefore, we request that the rule applicability be limited to emission units having a maximum heat input rate greater than 5.0 MMBtu/hr, which are located at major NOx sources. We also request that the District reinstate Definition 3.3 (Major NOx Source).

Section 2.0

The requirements of this rule shall apply to the operation of

lime kilns with a maximum heat input grate greater than 5.0 MMbtu/hr operated at a major NOx source.

Response: This rule goes beyond RACT to satisfy state BARCT requirements. Applicability should be designed to address smaller sources.

2. Comment: Kilns heat materials by contacting the materials with hot gases produced from combustion. Consequently, we request that the definition of Kiln be revised to reflect the nature of the heat transfer process:

Section 3.2

Lime Kiln: A unit in which direct heat is used to calcine lime mud, which consists primarily of oxidizing calcium carbonate, into quicklime, which is calcium oxide.

Response: The District concurs with this comment and the appropriate changes have been made.

3. Comment: Verbal comments were received by the District while meeting with the affected source. The items are summarized as follows:

1. Changing compliance date to provide adequate time for approval process of an alternate monitoring system.
2. Removing combustion optimization if compliance with the proposed limits can be demonstrated earlier.
3. Changing the averaging period.
4. Check about proposed testing port.

Response: District staff worked with industry representatives and made significant changes to the January 6 draft of Rule 4313. The combustion optimization requirements have been deleted and the compliance date has been moved up to September 2003. This change will also allow more time for an alternate monitoring system to be approved. The averaging period has been changed to be identical to draft Rules 4306 (Boilers, Steam Generators, and Process Heaters-Phase 3) and 4702 (Internal Combustion Engines-Phase 2). The District has no issue with the location of the testing port.

SUMMARY OF SIGNIFICANT COMMENTS
on the
October 2, 2002, DRAFT of RACT Rule:

Rule 4313 (Lime Kilns)

EPA Comments

1. Comments: After reviewing the October 2, 2002 draft of San Joaquin Rule 4313 (Lime Kilns) and discussing it with others at EPA, we have the following general comments.

1. The limits in the rule are based on a Wisconsin rule and are in units of lbs NOx/million Btu. We recommend that you revise the limits in draft 4313 to use units of lbs NOx/ton clinker produced. Reasons for this include:

    a. Variability in fuel economy from kiln to kiln and from kiln type to kiln type,
    b. Often kilns use a mixture of fuels which would be difficult to determine lb/mmbtu,
    c. Lbs NOx/million Btu does not promote fuel efficiency,
    d. This is not consistent with most other similar regulations, and
    e. Uncontrolled emissions vary with kiln type.

2. We recommend you consider existing kiln rules in other California Districts in establishing limits and other requirements for San Joaquin's lime kilns. Specifically, we recommend you review Mojave Rule 1161 and South Coast Rule 1112.

Response: Comments are repeated for clarity followed by the District's response:

1. The limits in the rule are based on a Wisconsin rule and are in units of lbs NOx/million Btu. We recommend that you revise the limits in draft 4313 to use units of lbs NOx/ton clinker produced. Reasons for this include:

A NOx limit in terms of lbs NOx/ton of clinker is inappropriate since the Valley's single lime kiln does not produce clinker. The lime kiln is used at a sugar beet processing plant, and the products of the kiln are lime and CO2. Regarding CO2, the exhaust gas is scrubbed before being emitted. In the scrubbing, CO2 is extracted from the exhaust for use in the sugar

manufacturing process, and it is believed that some of the NOx in the exhaust reacts with scrubber water to form nitric acid. This might act as a significant NOx control.

a. Variability in fuel economy from kiln to kiln and from kiln type to kiln type,

This point is moot since there is only one affected lime kiln. New units would be subject to LAER.

b. Often kilns use a mixture of fuels which would be difficult to determine lb/mmBtu,

The affected kiln generally uses distillate oil, although it might need to switch to natural gas to meet the limits in the rule. The operator has expressed concern about using natural gas however, because it reportedly does not produce enough CO2. If they do indicate a need to simultaneously burn multiple fuels, we'll add a provision for interpolating their multi-fuel emission limits, similar to the boiler rules.

c. Lbs NOx/million Btu does not promote fuel efficiency,

Rule 4313 is not intended to promote fuel efficiency, but to reduce NOx emissions.

d. This is not consistent with most other similar regulations,

This is an incorrect statement. The lime kiln is not a Portland Cement kiln, and should not be regulated by cement kiln standards. Rule 4313 has essentially the same requirements as (but broader applicability than) the Wisconsin rule, which is the only other one we could find that would apply to lime kilns at sugar beet plants.

e. Uncontrolled emissions vary with kiln type.

True, but simply changing the limits to lb NOx/ ton of product will not address this issue. If we had more than one type of kiln, we might need to adopt a different limit for each type, depending on available control technology.

2. We recommend you consider existing kiln rules in other California Districts in establishing limits and other

requirements for San Joaquin's lime kilns. Specifically, we recommend you review Mojave Rule 1161 and South Coast Rule 1112.

We have considered those rules, but the overriding fact is that those rules would not apply to sugar beet processing lime kilns located in those districts.

ARB Comments: None received.

Industry comments

1. Comment: We object to the adoption of both emission limits and combustion optimization requirements. The Wisconsin Rule has an exemption from combustion optimization if the equipment is subject to the rules' emissions limits. Furthermore, the Wisconsin Rule does not specify emissions limits for existing Lime Kilns, leaving those units subject only to combustion optimization requirements. Given the emission limits for the lime kiln we request that the combustion optimization requirements be deleted.

Response: Sections 4.5 and 6.0 have been added to add the option of complying with the rule sooner than the June 1, 2004 compliance date in lieu of completing combustion optimization requirements.

2. Comment: We request that the Continuous Emission Monitor System ("CEMS") requirement be deleted from proposed Rule 4313.

Response: Section 4.4 has been modified to allow the use of an APCO approved alternate monitoring system in lieu of operating a CEMS.

3. Comment: Our lime kiln generates both lime and CO2, which are essential in the manufacture of beet sugar. A reduction in the quality and quantity of CO2 directly impacts the juice purification process effectiveness. The molecular composition of natural gas is such that the combustion output of CO2 is reduced, which would impact the juice purification process. Furthermore, the heat value of natural gas is lower, reducing kiln temperature, and further reducing the amount of CO2 available for the process. Converting to natural gas-firing would render the factory inoperable without additional equipment and materials for supplemental CO2 and is not a technically viable option.

Response: Noted.

SUMMARY OF SIGNIFICANT COMMENTS
on the
February 15, 2002, DRAFT of RACT Rule:

Rule 4313 (Lime Kilns)

Draft Rule 4313 (Lime Kilns)

EPA Comments: None received.

ARB Comments

1. Comment: Section 5.2.1.3 incorrectly references USEPA Method 3 for stack gas oxygen, carbon dioxide, excess air, and dry molecular weight. Staff suggests removing the reference to Method 3. The remaining references, Method 3A or CARB Method 100 are sufficient and appropriate.

Response: Noted.

Industry comments:

2. Comment: For major sources doing minor modifications and/or administrative changes to comply with a new rule; do those changes constitute the need to change the permit, and for major sources their Title V permits?

Response: To the extent to which the facility may need to modify their equipment, this would require changes to existing permit conditions. Equipment modifications that are required to comply with the rule are not subject to New Source Review Requirements of BACT or offsets.

3. Comment: Regarding CEMs, the boiler rule has an alternate monitoring provision to CEMs, is the Kiln rule CEMs requirement a flat out requirement?

Response: Concur. Section 4.4 has been modified to allow the use of an APCO approved alternate monitoring system in lieu of operating a CEMS.

4. Comment: Is the source test an annual requirement?

Response: Yes, see Section 5.4 of the rule for the specific reference to the annual testing requirement.

5. **Comment:** Wisconsin kilns are different types of kilns as are the Portland cement type of kilns. The differences are in the combustion flow whereas they recover product and our kiln recovers gases. Does the rule consider different types of kilns?

Response: The Wisconsin kiln rule does not specify the type of kiln but rather places limits on the fuel type used at any type of kiln. Rule 4313 is also structured in the same manner. As mentioned in the workshop, Wisconsin processing facilities operate devices similar to those operated in the Valley.

APPENDIX B

SOCIOECONOMIC ANALYSIS FOR
Draft Rule 4313
January 6, 2003

San Joaquin Valley
Air Pollution Control District

January 2, 2003

DRAFT SOCIOECONOMIC ANALYSIS
DRAFT RULE 4313 (Lime Kilns)

I. Introduction

The California Health and Safety Code Section 40728.5 requires the San Joaquin Valley Unified Air Pollution Control District (District) to perform a socioeconomic impact assessment for any new or amended rules and regulations which will significantly affect air quality or emission limitations. Proposed Rule 4313 (Lime Kilns) would limit emissions of Oxides of Nitrogen (NOx) from lime kilns by setting NOx emission limitations, requiring the use of an emissions monitoring system, and requiring periodic NOx source tests. This report contains the District's assessment of the socioeconomic impacts of the proposed District Rule 4313 (Lime Kilns).

The Necessity of Amending Rule 4313

The San Joaquin Valley Air Basin (SJVAB) was reclassified from a serious to a severe non-attainment area for state and federal health based ambient ozone standards by the California Air Resources Board (ARB) and the United States Environmental Protection Agency (EPA) in October 2001. The reclassification was due to the SJVAB's failure to achieve attainment of the standard by the federally mandated deadline of November 15, 1999. Because it is classified as a severe ozone non-attainment area of the National Ambient Air Quality Standards (NAAQS), the SJVAB will be required by the federal Clean Air Act (FCAA) to attain the NAAQS for ozone by November 15, 2005.

Sections 182(b)(2) and 182(f) of the Clean Air Act require ozone nonattainment areas to implement Reasonably Available Control Technology (RACT) for sources that are subject to Control Technology Guideline (CTG) documents issued by the EPA, and for "major sources" of Volatile Organic Compounds (VOCs) and NOx. In serious ozone nonattainment areas, stationary source facilities that emit at least 50 tons of NOx or VOC per year are considered "major sources." For severe areas, the Clean Air Act expands the definition of "major source" to stationary sources that emit at least 25 tons per year of VOC or NOx. While the District has already adopted appropriate RACT provisions for CTG categories, the reclassification of the SJVAB to severe nonattainment requires the District to implement RACT for the newly defined major sources.

Also, because of the severe nonattainment reclassification, the District is required by Section 172 of the Federal Clean Air Act Amendments of 1990 to implement RACM as expeditiously as practical in order to attain the National Ambient Air Quality Standards (NAAQS) by reducing ozone-forming emissions of VOC and NOx. The EPA describes

RACM as control measures determined to be reasonable after considering their energy and environmental impacts, and their annualized capital and operations costs. In addition to implementing RACM, the California Clean Air Act requires nonattainment areas to adopt all feasible control measures for stationary sources of air pollution. The California Air Resources Board (ARB) interprets "every feasible control measures to mean that, at a minimum, a district considers regulations that have been successfully implemented elsewhere. They should also consider going beyond what has already been accomplished by evaluation of new technologies and innovative approaches that may offer potential emissions reductions. Further, districts should consider not only technological factors, but also social, environmental, economic (e.g., cost effectiveness), and energy factors which prevail in the district, along with the resources realistically available to the district to adopt, implement, and enforce the measures."

District staff believes that the implementation of Rule 4313 would satisfy the RACT and RACM requirements and would implement the feasible control measures for this source category.

Regulatory Content

The requirements in Rule 4313 are intended to reduce ozone-forming emissions of NOx from lime kilns. District staff estimate that these proposed requirements will result in a potential reduction of approximately 19 tons of NOx per year—a 46% decrease from current NOx emissions from lime kilns at major source facilities. The proposed NOx limits would be effective on and after June 1, 2004.

Impact Assessment

As specified in the Health and Safety Code, "socioeconomic impact" means the following:

- The type of industries or businesses, including small businesses, affected by the rule or regulation.
- The range of probable costs, including costs to industry or businesses, including small businesses, of the rule or regulation.
- The impact of the rule or regulation on employment and the economy of the region affected by the adoption of the rule or regulation.

II. Facilities Affected by Rule 4313

Industry Profile

Lime and its by-products are used by many different industries for various purposes. In the metallurgical industry, lime serves various purposes such as aiding in the purification of steel, and creating a furnace slag. In aluminum extraction, lime is used to free caustic soda

from sodium carbonate to allow the caustic to further react. In gold extraction, lime is used to maintain alkaline conditions during treatment by cyanide. In the extraction of other metals, lime is used to adjust the pH of the suspensions of ore in water to aid in the flotation process.

In the sugar industry, lime is used to reduce the acidity of the sugar juice after the sugar cane or beet has been crushed and the sugar washed out. This juice contains mud and other impurities and the lime is used to react with these impurities causing them to settle out of the juice and help them coagulate the mud. The solids are settled out of the juice, filtered leaving sugar juice, which undergoes further processing.

Lime is also used in other various industries. Potable water treatment plants add lime to stabilize the water and improve the retention of chlorine. The building industry uses lime as the basis of whitewash. It is also used to improve the workability and water tightness of cement mortars and is sometimes used as a plaster or white set. Lime can also act as a road stabilization binder in the presence of clay. As an alkali, lime neutralizes acidic conditions in soils due to water run-off from coal mines and in coal mine process water.

General Equipment Description

Lime kilns create lime through a process called calcination, where limestone ($CaCO_3$) is heated to temperatures above 900^o Celsius to drive off carbon dioxide. The resulting product is calcium oxide, or lime. It is not unusual for lime kilns to reach temperatures above 1500^o Celsius.

Lime kilns come in various shapes and sizes. The prevalent type of kiln is the rotary kiln, accounting for about 90% of all lime production in the United States. This kiln is a long, cylindrical, slightly inclined, refractory-lined furnace, through which the limestone and hot combustion gases pass counter currently. Coal, oil, and natural gas may all be fired in rotary kilns. Product coolers and kiln feed preheaters of various types are commonly used to recover heat from the hot lime product and hot exhaust gases, respectively.

The next most common type of kiln in the United States is the vertical, or shaft, kiln. This can be described as an upright heavy steel cylinder lined with refractory material. The limestone is charged at the top and is calcined as it descends slowly to discharge at the bottom of the kiln. The primary advantage of vertical kilns over rotary kilns is higher average fuel efficiency and the disadvantages of vertical kilns are their relatively low production rates and the fact that coal cannot be used without degrading the quality of the lime produced.

Other, much less common, kiln types include rotary hearth and fluidized bed kilns. Both kiln types can achieve high production rates, but neither can operate with coal. The “calcimatic” kiln, or rotary hearth kiln, is a circular kiln with a slowly revolving doughnut-shaped hearth. In fluidized bed kilns, finely divided limestone is brought into contact with hot combustion air in a turbulent zone, usually above a perforated grate. Because of the amount of lime particle carryover into the exhaust gases, dust collection equipment must

be installed on fluidized bed kilns to prevent the buildup of particles and to keep the process flowing smoothly.

General Industry and Market Characteristics

District staff is aware of only one major source facility operating a lime kiln within the District that will be impacted by the proposed rule. It is a sugar beet processing facility owned by a large, national processor and marketer of refined sugar. The company acquired the sugar beet processing facility in 1996. The facility has a workforce of approximately 250 employees, according to representatives that attended the focus group meeting for the proposed rule.

Within the past fifteen years, the national company owning the affected facility has experienced significant acquisitions and downsizing in its number of sugar manufacturing facilities. Before 1988, the company owned only a single sugar cane refinery in Sugar Land, Texas. The company grew exponentially in 1988, when it merged with a corporation that owned eight beet-sugar processing plants, located in California, Wyoming, Montana, and Texas. Later in 1996, the company acquired a beet sugar company in California consisting of three beet-sugar processing plants. A year later in 1997, the company bought out the second largest sugar refiner in the U.S. sugar industry. The refiner had owned four sugar beet processing plants in Michigan, one in Ohio, and three sugar cane refineries in Georgia, Florida, and Louisiana. Despite the closures of a few of these facilities in the 1990's, the company was the largest processor and marketer of refined sugar in the United States at the beginning of 2000. But U.S. wholesale refined sugar prices fell dramatically from about 27 cents per pound in 1999 to roughly 21 cents per pound in 2000—the lowest U.S. price of wholesale refined sugar for the past twenty years. At the end of September in 2000, the company reported owing $456.4 million to various banks and other large lending institutions while losing $34.6 million the previous year. In January 2001, the company was unable to meet its payment deadlines and filed for bankruptcy under Chapter 11 of the U.S. Bankruptcy Code. At the end of the same year, the company closed two of its four beet processing facilities in California. It sold the four beet processing facilities in Michigan in February 2002, a beet processing facility in Worland, Wyoming in June 2002, and three beet processing facilities in Montana, Wyoming, and Texas in October 2002. In December 2002, the company closed its original sugar cane refinery in Sugar Land, Texas. Currently, the company processes sugar beets at two facilities in California and refines cane sugar at two refineries in Louisiana and Georgia. One of the two California beet processing facilities that the company still owns is the facility affected by proposed Rule 4313.

Until recently, the company that owns the affected facility was also a distributor of sugar, savory products, drink mixes, and desserts to the foodservice industry. In 1997, the aforementioned acquisition of the second largest sugar refiner in the U.S. sugar industry gave the company facilities in Georgia, Ohio, and California that manufacture individual portions of salt, pepper, sugar, and sugar substitutes. In 1998, the company acquired a business that manufactures nutritional dry mixes, sauces, seasonings, drink mixes, and desserts at five facilities in Massachusetts, Oklahoma, Georgia, Iowa, and Indiana. The

company began to downsize when it filed for bankruptcy in January 2001. In February 2001, the company sold its line of nutritional products but kept all the facilities that it had acquired in its 1998 purchase. In December 2001, the company sold a packaging operation belonging to the business it had acquired in 1998. In December 2002, it signed a letter of intent to sell the entire subsidiary, consisting of facilities that manufacture products for the foodservice industry in Georgia, Iowa, Ohio, California, and Indiana.

The company purchased the second largest sugar refiner in the U.S. in 1997 for $750 million. It bought out the foodservice industry supplier in 1998 for $120 million. On January 16, 2001 when it declared bankruptcy, the company reported owing roughly $457 million. The company sold its nutritional line of products belonging to its foodservice industry subsidiary for $65 million and its packaging operation acquired in 1998 for $28 million. It plans to sell the foodservice industry subsidiary for $115 million. In 2002, the company sold its four Michigan sugar beet processing plants for $55 million and its three sugar beet processing facilities in Wyoming, Montana, and Texas for $34 million. The company's net sales revenue for the 2002 fiscal year totals $1.30 billion.

District staff used national U.S. Census Bureau data to estimate the annual value of shipments for an average sugar beet processing facility and to derive the average annual salary for an employee working at a sugar beet processing facility. The data and the extrapolated values are shown in Table 1 and Table 2 below.

Table #1
General Economic Characteristics of the Industry

National Data using 1997 U.S. Census Bureau Nationwide Data for this Industry Group

NAICS[2]	Total Number of Establishments Nationwide[1]	Total Number of Employees all Establishments Nationwide[1]	Total Value of Shipments[1]	Total Annual Payroll[1]
311313 Beet Sugar Manufacturing	36	7,718	$2,732,503,000	$252,236,000

- $252,236,000 total annual payroll / 7,718 total # employees = $32,682 National annual average salary for employees in this industry group.
- ($8,560 annual compliance cost / $32,682 national annual average salary for beet sugar manufacturing employees) x 100 = 26.2%

Explanation of footnotes in Table #1:

[1] The 1997 U.S. Census Bureau national data isolated for NAICS Code 311313 Beet Sugar Manufacturing at web page www.census.gov/epcd/ec97/us/US000_31.htm. The U.S. Census Bureau defines Value of Shipments as total sales, shipments, receipts, or business done by establishments. In the case of multiunit companies, the manufacturer was requested to report the value of products transferred to other establishments of the same company at full economic or commercial value.

[2] North American Industry Classification System (NAICS) supersedes the Standard Industrial Classification (SIC). Both the NAICS and SIC categorize establishments by the principal activity in which they are engaged. For discussions on the relationship between NAICS and SIC, refer to the following web page: www.census.gov/epcd/ec97/intorgen.htm. Description of NAICS 311313 – This industry comprises establishments primarily engaged in manufacturing refined beet sugar from sugar beets.

Table #2
General Economic Characteristics of the Affected Facility

Affected Entity Characteristics from Focus Group Discussions & Extrapolation from National Data

	Estimated Annual Value of Shipments[1,2]	Number of Employees[3]
Mendota Sugar Beet Processing Facility	$42,000,000 - $88,510,722	250

- ($8,560 annual compliance cost / $42,000,000 low-end estimated annual value of shipments) x 100 = 0.020%
- ($8,560 annual compliance cost / $88,510,722 high-end estimated annual value of shipments) x 100 = 0.0097%

Explanation of footnotes in Table #2:

[1] Used information provided by representatives from the affected source at the socioeconomic focus group meeting for Rule 4313, October 17, 2002 to calculate the low-end cost for Estimated Annual Value of Shipments; multiplied the reported sale of 2,000,000 hundred weight of sugar at a reported rate of $21/hundred weight = $42 million.

[2] Used the 1997 U.S. Census Bureau national data to calculate the high-end cost for Estimated Annual Value of Shipments (see note #1 in Table #1); assessed a per employee ($2,732,503,000 / 7,718) revenue of $354,042 and multiplied by the # of employees at the affected facility, 250 ~ $89 million.

[3] From discussions with the affected source at the socioeconomic focus group meeting for Rule 4313 on October 17, 2002, and further confirmed by U.S. Census Bureau County Business Patterns 2000 Data for United States Economic Profiles Web page at censtats.census.gov/cgi-bin/cbpnaic/cbpcomp.pl, which reports the Fresno County facility to have between 250-499 employees.

III. Compliance Costs Estimated for Amendments to Rule 4313

In April 2002, District staff received a letter from the affected facility, stating that proposed Rule 4313 would require the facility to spend a minimum of $300,000 to purchase capital equipment that enables kiln firing on natural gas. The facility also estimated that the proposed rule would require annual operating costs of $140,000, associated with operating on natural gas instead of fuel oil and conducting annual source testing. After receiving a letter from District staff in May 2002, stating that the facility's estimated compliance costs would result in significant emission reductions in a cost effective manner, the facility declared in a subsequent workshop and later in a letter that converting the beet sugar manufacturing lime kiln to operate on natural gas would render the factory inoperable. The facility explained that natural gas has a lower CO2 combustion output than does fuel oil, impacting the juice purification process, and that the heat value of natural gas is also lower than that of fuel oil, which would reduce kiln temperature and consequently the amount of CO2 available for juice purification. The facility concluded that converting to natural gas would require the purchase of additional equipment and materials for supplemental CO2, which it declared is not a technically viable option, in order for the facility to remain operational.

But representatives from the affected facility noted at the focus group meeting that their facility may already be in compliance with the NOx limits proposed in Rule 4313. The facility operates a closed system that vents to the atmosphere only through two stacks at the end of the sugar purification process. The gaseous products of combustion from the lime kiln travel through three different water spray scrubbers, a gas compressor, and

finally a tank filled with sugar water before they exit through the stacks to the atmosphere. Representatives from the affected facility suggested that the NOx emitted from the lime kiln may be chemically altered as it passes through the water spray in the scrubbers and the sugar juice in the tanks before it can reach the atmosphere.

On November 18, 2002, the company hired a private contractor to conduct a NOx source test. The contractor sampled the gas after it had passed through the three scrubbers and the gas compressor but before it had reached the tank of sugar water. The portable NOx analyzer reported NOx concentrations in the effluent gas that were significantly lower than the maximum NOx concentrations allowed in proposed Rule 4313, and it appears that the affected facility is already in compliance with the NOx limits proposed in Rule 4313.

Therefore, the only costs that the facility will incur due to enactment of proposed Rule 4313 are required emissions monitoring and source testing. District staff understands that the facility plans to use an Alternate Emission Monitoring System, possibly involving monthly monitoring of NOx emissions with a portable NOx analyzer in lieu of CEMS. The cost to use this particular Alternate Emission Monitoring System involves the capital cost of purchasing a portable NOx analyzer and an annual operation and maintenance cost. The company estimated that the portable NOx analyzer would cost up to $6,500 and that the calibration and maintenance of the analyzer would cost about $7,000 per year (calculated at $1,000 per month over the seven months that the facility operates). Source testing, the other cost-related provision in proposed Rule 4313, will be conducted annually for at least two years and then triennially if the first two source tests are passed. District staff estimates that the cost for conducting a NOx source test is roughly $1,500. District staff expects that the facility will comply with the NOx limits and consequently be required to conduct the test once every three years, so the $1,500 is distributed over a three-year period at $500 per year. Annualizing the capital cost of the portable NOx analyzer over a period of ten years at ten percent interest and adding the cost to source test and operate and maintain the portable NOx analyzer to the annualized capital cost yields a total annual compliance cost of $8,560 for proposed Rule 4313.

IV. Impacts on Employment and Regional Economy from Proposed Rule 4313

Business Responses to Increased Costs and Employment Considerations

This study utilizes business response information provided by industry focus group participants. The affected entity's compliance option and costs are discussed in the previous section of this report. It should be noted that while socioeconomic impact analysis reports can only examine the effects of a particular rule project on affected industries, facilities are often required to comply with several new rule projects in a short time span, and though the impacts of any particular rule may be inconsequential, the cumulative impacts of those rules on the affected facilities may be considerable. For proposed Rule 4313, the facility's relatively small potential compliance cost compared to its reported estimated annual value of shipments and to the national average annual

salary of a sugar beet processing plant employee suggests that the impact of the rule will be minimal.

The facility will likely subsidize compliance costs by accessing profits, and there will probably be no impact on employment from proposed Rule 4313. Table 2 shows that the compliance cost for proposed Rule 4313, taken as $8,560, is only 0.020% of the low-end estimated annual value of shipments for the affected facility, and 0.0097% of its high-end annual estimated value of shipments. The cost to comply with proposed Rule 4313 is a small fraction of the revenue that the facility generates in a year. Table 1 shows that the cost to comply with the proposed rule is roughly one quarter of one employee annual salary for the sugar beet industry. The comparisons of compliance cost to value of shipments and average employee salary suggest that the facility will most likely use funds from its sales to pay for the cost to conduct source tests.

Socioeconomic impacts from the rule on the regional economy cannot be assessed in the traditional method since the rule impacts one facility. But considering the relatively small compliance cost associated with the rule, the impact of proposed Rule 4313 on the regional economy will likely be negligible.

V. In Summary

A NOx source test has demonstrated that the one affected facility already complies with the proposed NOx limits in Rule 4313. The total annual compliance cost for proposed Rule 4313 will therefore be approximately $8,560 for using an Alternate Emission Control System and conducting NOx source tests. The impact of proposed Rule 4313 will be nominal, considering the facility's large estimated annual value of shipments compared to its potential annual compliance costs. Since this rule impacts one facility, it is difficult to clearly assess the impact of the rule on the regional economy.

VI. References

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